



Oregon Bioscience Association

Oregon's Bio Boom 2022 Economic Impact Report Executive Summary

Measuring the Economic, Fiscal and Demographic Impacts of Oregon's Bioscience Industry including Clark County, Washington

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Dear Colleagues,

With the mission of hope, health and healing, the framework of our region's bioscience ecosystem continues its upward trend by nearly every indicator. The upshot: Oregon's 1,480 life science firms and leading academic and research institutions generated total economic impact of almost 66,000 jobs and \$15.7 billion in output, creating more than \$600 million in local tax and fee revenues.

As we've long held bioscience is, by nearly every measure 'recession proof,' we intentionally cast our net throughout the ecosystem during a most strenuous time: the first year during the SARS-CoV2 pandemic. Our industry – not only locally but around the world – rose fast to answer the needs of the pandemic in 2020 and since.

Here, our data dive into private bioscience and life science research and focus on the first full year of the pandemic in 2020, thus underscoring the resilience of our industry, its scientists, labs, startups, growth stage companies, funders, leaders, policymakers and the rapidly rising rate of influx of public and private sector dollars into Oregon and southwest Washington, specifically Clark County. Indications are this trend continues as this chart shows.

To put a finer point on the data you'll discover here, our industry ripples with both buoyancy and halo. In this round of data, we note a higher economic multiplier for both overall employment and income than most other industries in Oregon.

And we've taken to opportunity to show a running historical purview comparing the upward growth since our first measurements in 2002, showing an 85 percent increase in private jobs and 123 percent growth in life science research employment in Oregon. This year we also made measurement in Clark County, Washington.

This year's Economic Impact Report: Oregon's Bio Boom outlines these and many other measures of success. While Oregon's biotechnology and life sciences sectors have done well, we must continue to inspire a supportive and collaborative environment in our region, encouraging bioscience companies to start, grow and stay here. Oregon Bioscience Association is working with industry, academia and policymakers to streamline and model regulations, increase education and research funding, improve the tax climate and deliver other policy changes that will advance health innovation and preserve patients' access to care and therapies. Thank you for being part of such success.

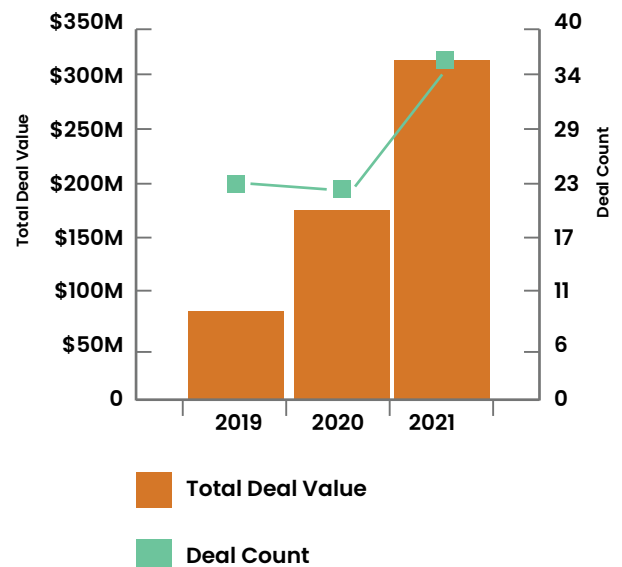
Sincerely,



Liisa Bozinovic, Executive Director

VC Investment

Annual value and count of venture capital deals with health care firms based in Oregon and S.W. Washington



Source: 2021 Pitchbook and the Portland Business Journal



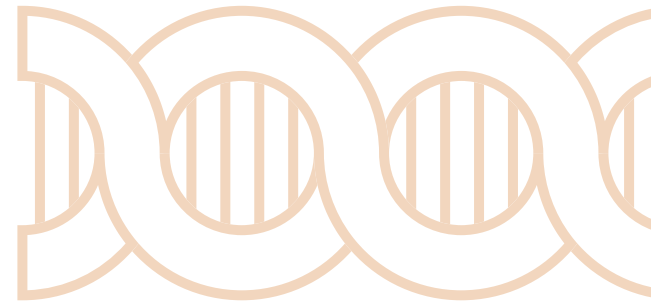


INTRODUCTION

Pinnacle Economics, Inc.,¹(Pinnacle) was engaged by the Oregon Bioscience Association to measure the economic, fiscal, and demographic impacts of the bioscience industry in Oregon in 2020. This represents the sixth such study, and updates previous efforts that measured the bioscience industry in 2002, 2007, 2009, 2014, and 2017. ²This study also expands its geographic scope to include Clark County, Washington. Similar to previous studies, the bioscience industry consists of the following two general categories:

1. Private bioscience represents bioscience-related activities carried out by private companies within five industry sectors: 1) agricultural feed stocks and chemicals manufacturing, 2) drugs and pharmaceutical manufacturing, 3) medical devices and equipment manufacturing, 4) research, testing, and medical laboratories, and 5) bioscience-related distribution. These industry sectors are in alignment with TEconomy Partners, LLC., and Biotechnology Innovation Organization’s 2020 industry definition. ³
2. Life science research at universities and hospitals.

To quantify the direct economic impacts (or dimensions) of the bioscience industry, Pinnacle relied on detailed, firm-level wage and employment data from the Oregon Employment Department (OED) and aggregated wage and employment data from the Washington Employment Security Department (ESD), as well as funding, expenditure, payroll and employment data gathered by Oregon Bio from research universities and hospitals in Oregon and Clark County.⁴ These direct measures were then augmented with additional data from an economic impact models of Oregon and Clark County developed using the IMPLAN software. The total economic impacts or contributions of the bioscience industry are larger than the industry itself because bioscience spending and incomes generate additional economic activity in other sectors of the economy. That is, the total economic impacts of the bioscience industry in Oregon and Clark County include the direct economic activity plus secondary or multiplier effects generated as a result of supply-chain (indirect impacts) and consumption-driven (induced impacts) spending in other industries. These multiplier effects were measured using IMPLAN economic impact models of the Oregon and Clark County economies in 2020.



¹Alec Josephson, economist and president of Pinnacle Economics, is the sole author of this report. With 30 years of economic consulting experience, Mr. Josephson is a nationally recognized expert in economic impact analysis and has directed, conducted, and/or authored well over 1,000 economic impact studies. See www.pinnacleecon.com.

²Caution must be exercised with time series analyses, especially with structural or definitional changes in industries (QCEW data) or the input-output modeling framework (IMPLAN). According to OED, “Occasionally employment levels in a QCEW dataset will suddenly shift for reasons unrelated to true economic change.” These reasons include boundary changes, changes in geocoding methodology, non-economic code changes, and multiple worksite reporters. (See OED’s “Annual Geocoded QCEW Data File User’s Guide & Data Dictionary,” September, 2021.) Pinnacle and Oregon Bio worked with OED economists at the beginning of this project to better understand potential changes to the underlying QCEW data, especially with respect to some firms not having complete Oregon location data. OED confirmed that these businesses reported working in Oregon but may not have address data because they do not have a “brick and mortar” location, e.g., an employee working remotely from their Oregon residence for a company located outside of Oregon. In addition, the newer IMPLAN modeling framework has more industry sectors than the model used in the previous report, and this is especially relevant for bioscience-related distribution where the expanded IMPLAN sectoring framework went from one wholesale trade sector to nine wholesale trade sectors. While this change will affect the underlying economic impact numbers, it will also likely improve the reliability of the multiplier effects estimated by the IMPLAN model for this private bioscience sector.

³The private bioscience industry is defined using North American Industry Classification System (NAICS) codes originally developed in Battelle and Biotechnology Innovation Organization (BIO) national studies conducted for 2006, 2007, 2010, and 2012. This definition was updated by TEconomy Partners, LLC., and BIO in their 2014 study and continues in their most recent 2020 study. See TEconomy/BIO, *The Bioscience Economy: Propelling Life-Saving Treatments, Supporting State & Local Communities, 2020*.

⁴Clark County is included in this report to more fully quantify the bioscience industry in the larger, greater Portland area where business linkages and commuter flows between states are significant.

Independently Prepared for the Oregon Bioscience Association by Pinnacle Economics, Inc.



KEY FINDINGS



Grace Bio Labs manufactures products for the global vaccine research community. During the pandemic, our industry faced raw material shortages, supply chain delays and most importantly – our employees’ ability to work in the labs while juggling care for family members during closures. Our team at Grace Bio Labs quickly pivoted our resources, schedules and raw materials. We flexed laboratory schedules to meet required social distancing which also allowed employees to accommodate family care needs. **Our team developed a new product line with our raw materials critical to front line workers in local hospitals.**

Lisa Hale – CEO, Grace Bio Labs, Bend, Oregon

Private bioscience consisted of 1,480 establishments that directly generated \$7.6 billion in output and employed 16,820 workers who received \$1.5 billion in wages. Adding in payroll taxes and other benefits, the total income for employees in private bioscience was over \$1.8 billion. Private bioscience generated \$1.4 billion in other income such as profits, royalties, rents and dividends. With \$4.4 billion in exports (58 percent of industry output), private bioscience brings “new” money to the state. In 2020, private bioscience firms and employees directly generated \$245.9 million in tax and fee revenues for state and local governments.

- According to OED data, the average annual wage in private bioscience was \$88,440 or 50 percent greater than the statewide average wage (\$58,966) for private sector employment in 2020.
- Private bioscience exists in nearly every Oregon county and is well represented outside of the three-county Portland area. In 2020, 535 private bioscience firms are known to be located outside of Portland, and they employed 6,640 persons and generated \$481.1 million in wages.⁵
- Since the first study for 2002, private bioscience employment increased 85 percent (+5,270 jobs), total wages increased 215 percent (+\$593.4 million), and average annual wages increased 71 percent (+\$31,340).⁶ This robust growth across all direct measures is not unexpected, as private bioscience has exhibited steady growth in employment and wages across all six studies.⁷

Table ES1

Bioscience Direct Impacts by Sector (\$ millions*)

Measure	Private Bioscience	Life Science Research	Total Bioscience
Jobs	16,820	5,870	22,690
Output*	\$7,560.5	\$882.3	\$8,442.9
Income*	\$1,804.0	\$643.8	\$2,447.8
• Wages*	\$1,487.6	\$522.8	\$2,010.4
Other Income*	\$1,417.7	\$81.4	\$1,499.1
Exports*	\$4,357.9	\$83.7	\$4,441.6
Average Annual Wage	\$88,440	\$89,074	\$88,604
State and Local Tax and Fee Revenues*	\$245.9	\$45.0	\$291.0
Federal Tax and Fee Revenues*	\$420.3	\$132.6	\$552.9



By accelerating the creation of new bioscience startup companies in the Willamette Valley, we advance a more connected local ecosystem where companies can grow and thrive right here. Building the right bridges from academia to launch to commercialization to growth, we embody job creation that endues a high economic multiplier effect. Our Oregon ecosystem offers jobs paying an average of \$88,440 annually. With programs like the EUG Launchpad Accelerator, Onward Career Tours, and On-the-Job Training, we are also making these high-paying jobs increasingly accessible to everyone.

–Matt Sayre, Managing Director, Onward Eugene, Oregon

⁵OED location data is not available for some establishments known to be operating in Oregon in 2020.

⁶These changes were estimated after controlling for Battelle/BIO’s revised definition of private bioscience in 2014, i.e., bioscience-related distribution and some bioscience subsectors are not included.

⁷For comparison, all private industries in Oregon show a 19 percent increase in employment and a 112 percent increase in total wages between 2002 and 2020. In addition, compared to other Oregon industry sectors at the 3-digit NAICS code level, private bioscience would rank eighth in employment growth over the 18 year period. (This comparison uses Oregon QCEW data, and involves 79 industry sectors with employment greater than 500 jobs in both time periods.)

Life science research at Oregon universities and hospitals directly generated \$882.3 million in economic activity, including \$522.8 million in wages and 5,870 jobs. Including payroll taxes and benefits, total income for employees in life science research amounted to \$643.8 million. In addition, life science research institutions and employees directly generated \$45.0 million in state and local taxes.

- The average annual wage for life science research institutions was \$89,100 in 2020, or 51 percent greater than the statewide average wage for private sector employment.⁸
- Similar to private bioscience, life science research has experienced significant and steady growth. Since the first study for 2002, employment in life science research increased 123 percent (+3,240 jobs), total wages increased 259 percent (+\$377.3 million), and average annual wages increased 61 percent (+\$33,740).

Previous reports showed steady growth in life science research over time and significant growth recently. Life science research employment and wages increased 29 percent and 30 percent, respectively, between 2017 and 2020 as NIH funding for Oregon increased from \$310.9 million to \$424.0 million (or by \$113.1 million or 36 percent) over that same time period.

Oregon’s combined bioscience industry (private bioscience plus life science research) directly generated \$8.4 billion in economic activity, including \$2.0 billion in wages, 22,690 jobs and \$4.4 billion in exports in 2020.⁹ Bioscience firms and their employees directly generated \$291.0 million in state and local taxes.

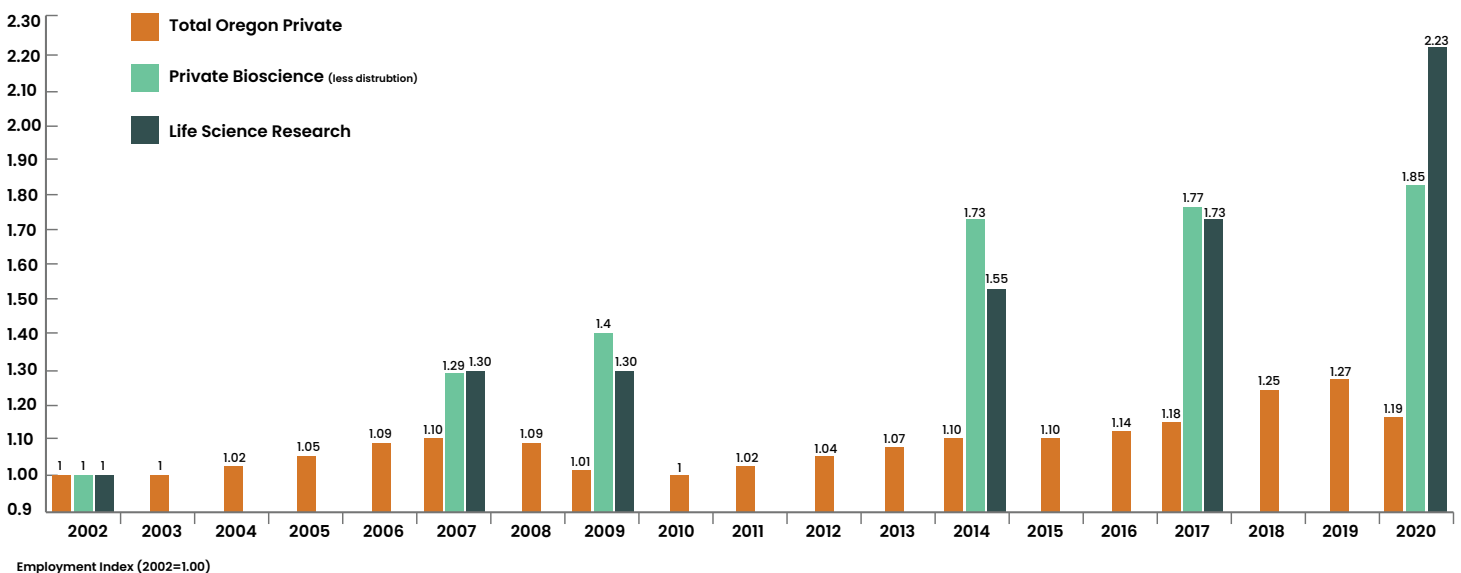
- Total bioscience employment increased by 8,509 jobs (+96 percent) between 2002 and 2020, with substantial employment growth in both private bioscience (+85 percent) and life science research (+123 percent).



As a young medical device company in the Willamette Valley, the thriving Oregon startup ecosystem has been critical in our ability to grow – Lazarus 3D has been supported through mentorship, training, networking and also promoting us as a woman-owned startup. The launch of Pre-Sure for surgical rehearsals on a personalized level was our huge milestone, and we’re grateful to be a part of **fostering such a strong community for health tech here.**

–Smriti Zaneveld, Ph.D., Founder and President, Lazarus 3D Inc., Albany, Oregon

Figure ES1
Bioscience Employment Changes, 2002–2020



⁸Average annual wages are down slightly since the previous study due to increased life science research activities at universities, which pay slightly less on average, and decreased life science research activities at hospitals, which pay slightly more on average.

⁹Bioscience export activity is largely attributed to private bioscience. However, much of life science research is funded by local and non-local private sources, and the federal government. In 2020, the National Institutes of Health funded \$424.0 million in medical research in Oregon. Similar to exports, non-local funding represents new dollars for the Oregon economy.

The direct economic activity associated with Oregon’s bioscience industry will have secondary or “multiplier” spending effects for other sectors of Oregon’s economy. Pinnacle estimates that the **total economic activity attributed to Oregon’s bioscience industry amounts to \$15.7 billion in output (or sales), including \$5.0 billion in income and almost 66,000 jobs in 2020.** In addition, Oregon’s bioscience industry is linked to economic activity that supports \$609.6 million in tax and fee revenues for state and local governments, as well as \$1.1 billion in federal government tax revenues.

Table ES2
Bioscience Total Impacts (\$ millions*)

Impact Measure	Direct	Indirect	Induced	Total
Jobs	22,690	21,331	21,912	65,932
Output*	\$8,442.9	\$3,884.1	\$3,372.5	\$15,699.5
Income*	\$2,447.8	\$1,460.7	\$1,122.8	\$5,031.3
Other Income	\$1,499.1	\$604.0	\$732.5	\$2,835.6
State and Local Taxes/Fees*	\$291.0	\$147.2	\$171.4	\$609.6
Federal Taxes/Fees*	\$552.9	\$298.0	\$242.3	\$1,093.3



We are bringing our ‘Factory of the Future’ facility online in 2022 and looking to establish relationships with key educational and industry organizations to recruit talented employees across the organization where they can grow in a wide range of careers.

-Emily Leproust, Ph.D., CEO and Co-Founder, Twist Bioscience, Wilsonville, Oregon

As shown in Table ES3, the bioscience industry generates economic activity in every sector of the Oregon economy. Secondary impacts attributed to bioscience include:

- Indirect or supply-chain impacts of \$3.9 billion in economic activity, including \$1.5 billion in income and 21,331 jobs. Approximately 20 percent of indirect job impacts accrue to the professional and technical services sector, benefiting employees and firms in marketing, management, computer programming and design, accounting, legal, advertising, and architectural and engineering.
- Induced or consumption-driven impacts of \$3.4 billion in economic activity, including \$1.1 billion in income and 21,912 jobs. These relatively large induced impacts are attributed to the high-paying jobs in bioscience, as well as indirect impacts in Oregon that occur in high-wage sectors.

Table ES3
Bioscience Total Impacts by Major Industry Sector

Major Industry Sector	Output	Income	Jobs	Jobs % of Total
Natural Resources	\$33.6	\$9.8	314	0.5%
Utilities	\$155.0	\$19.6	135	0.2%
Construction	\$74.8	\$24.0	348	0.5%
Manufacturing	\$3,727.8	\$670.4	7,447	11.3%
Trade	\$3,865.1	\$1,083.8	11,463	17.4%
Transportation	\$389.8	\$153.1	2,717	4.1%
Services	\$7,231.2	\$2,975.7	42,331	64.2%
Government	\$222.1	\$94.9	1,177	1.8%
Total All Industries	\$15,699.5	\$5,031.3	65,932	100.0%



From an economic impact perspective, the bioscience industry generates multiplier spending effects that benefit workers and business owners in other sectors of the Oregon economy. All else considered, the larger the multiplier, the greater the interdependence between an industry and the rest of the economy. According to the economic impact model of Oregon, the bioscience industry, in aggregate, has the following multipliers:

- An **employment multiplier of 3.1**, which suggests that every 10 jobs in the bioscience industry supports an additional 21 jobs in other sectors of the Oregon economy.¹⁰
- An **income multiplier of 2.2**, which shows that every \$1 million in income directly generated in the bioscience industry is linked to another \$1.2 million in income for workers and business owners in other industries in Oregon.

In 2020, of the 65,932 total jobs that are linked to Oregon’s bioscience industry, approximately 29,890 jobs were held by women and 14,430 jobs were held by minorities, including 1,830 jobs for Blacks, 6,100 jobs for Hispanics, 3,900 jobs for Asians, and 2,600 jobs for all other races.

- In 2020, the bioscience industry directly employed 10,450 women (46 percent of bioscience employment) and 4,800 minority workers (21 percent of bioscience employment).

Table ES4
Bioscience Job Impacts for Women and Minorities(\$ millions)

Demographic Group	Direct	Indirect	Induced	Total	% of Total
Women	10,450	8,350	11,090	29,890	45.3%
All Minorities	4,770	4,590	5,070	14,430	21.9%
• Black	470	660	700	1,830	2.8%
• Hispanic	1,730	1,950	2,420	6,100	9.3%
• Asian	1,770	1,110	1,020	3,900	5.9%
• All Other Races	800	870	930	2,600	3.9%



In Oregon nearly 15 years ago, we opened our Hillsboro Technical Operations (HTO) facility, which plays a key role in the filling, packaging and distribution of Genentech and Roche medicines worldwide. In 2021, we opened a second facility in Hillsboro dedicated to pioneering individualized therapies as part of our commitment to the future of personalized healthcare. Combined, these facilities represent a \$650 million investment in the domestic production of medicines. We also expanded our presence to Portland, opening a new office in 2019 dedicated to patient access and adding more than 300 jobs to the local market – **now we employ more than 900 here in Oregon.** We are committed to advancing a more just and equitable healthcare system, and that includes ensuring diverse representation across all aspects of our business.

–Baoshu Zhao, Ph.D., VP and Site Lead, HTO
 –Astou Gaye, VP and Site Lead, Hillsboro Individualized Therapies
 –Mike McHugh, Executive Director and Site Lead, Portland Access Solutions
 Hillsboro and Portland, Oregon



¹⁰This is 65 percent greater than the weighted average IMPLAN job multiplier (1.87) across all industry sectors in Oregon. Weighted average job multipliers use industry employment to reflect the size or importance of each industry sector.



CLARK COUNTY

This study expands its geographic scope to include the bioscience industry in Clark County, Washington. The key findings of the bioscience industry in Clark County in 2020 include:

Private bioscience in Clark County consisted of 150 establishments that produced \$1.4 billion in output and employed 2,456 workers with wages of \$228.4 million. Adding in payroll taxes and other benefits, the total income for employees in private bioscience was over \$271.8 million. With \$1.2 billion in exports (85.7 percent of output), private bioscience brings new money to Clark County.

- Life science research at Washington State University’s Vancouver campus received \$3.1 million in funding in 2020.

Table ES5
Private Bioscience Direct Impacts in Clark County, 2020 (\$ millions*)

Economic Measure	Total Private Bioscience
Jobs	2,456
Output*	\$1,382.3
Income*	\$271.8
• Wages*	\$228.4
Other Income*	\$233.2
Exports*	\$1,184.5
Average Annual Wage	\$92,996
State and Local Taxes/Fees*	\$30.51
Federal Taxes/Fees*	\$63.8

The total economic impacts attributed to Clark County’s bioscience industry (including both private bioscience and life science research) consist of \$1.9 billion in output, including \$416.3 million in income and 5,410 jobs. In addition, the economic activity linked to Clark County’s bioscience industry generated \$56.8 million in tax and fee revenues for state and local taxing jurisdictions.

Table ES6
Private Bioscience Direct Impacts in Clark County, 2020 (\$ millions*)

Economic Measure	Direct	Indirect	Induced	Total
Jobs	2,478	1,861	1,071	5,410
Output*	\$1,385.4	\$320.2	\$164.2	\$1,869.7
Income*	\$274.3	\$91.5	\$50.5	\$416.3
Other Income*	\$233.6	\$54.3	\$36.6	\$324.6
State and Local Taxes/ Fees*	\$30.6	\$12.6	\$13.6	\$56.8
Federal Taxes/Fees*	\$94.9	\$33.3	\$25.8	\$154.1



We had great support in the early days as an anchor company in the OTRADI Bioscience Incubator when we launched in Portland. Now located in Clark County, we’ve continued to grow, most recently with our 2021 initial public offering. We find the community to be incredibly supportive of entrepreneurship and the technology we have and continue to develop. We’re expanding and recruiting effectively with all the Pacific Northwest has to offer. We are beginning to see other biotech companies expand to include greater Portland-area facilities. We at Absci hope to help draw even more development to the region.

–Sean McClain, Founder and CEO, Absci, Vancouver, Washington

Clark County’s bioscience industry has a multiplier spending effect as bioscience firms create additional local economic activity through supply-chain spending and the direct and indirect income creates additional consumption-driven spending.¹¹ For example, every \$1 million in bioscience output is linked to \$1.4 million in total economic activity, including \$300,500 in income, 3.9 jobs, and \$41,000 in state and local tax and fee revenues.

¹¹Given the different sizes of the Oregon and Clark County economies, multipliers should not be compared across study areas. All else the same, economic and fiscal impact multipliers will be smaller for economic study areas that are defined more narrowly. This is due to the fact that multipliers are inversely related to leakages or imports, i.e., the greater the propensity to import, the lower the multiplier.

Thank you to our Sponsors



Oregon Bioscience Association

Oregon Bio, a member trade association, was formally established as a 501(c)(6) non-profit in 1989 by a consortium of universities, public officials, educators and bioscience executives to cultivate a regionally synergistic climate in which to build a bioscience community. Today, Oregon Bio supports the regional bioscience community through networking, workforce development, educational programs, enterprise support, advocacy and the promotion of research collaborations. As the collective voice for our bioscience community, Oregon Bio is responsible for communicating the industry's economic impact, issues and challenges to the public sector, educators and the general public. Oregon Bio continually seeks ways to promote and support sustainability and growth in the life science, biotechnology, digital health and device manufacturing sectors. Oregon Bio offers a host of member services to lower operational costs and promote partnering, so members can achieve their scientific, economic and social potential. Oregon Bio is an affiliate of the Biotechnology Innovation Organization.